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## LARVAL MITES (ACARI: TROMBIDIIDAE) PARASITIC ON APHIDS IN IRAN: KEY, A NEW SPECIES AND NEW RECORD

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A key to larvae of Trombidiidae (Acari: Prostigmata) found ectoparasitic on aphids in Iran is presented. *Allothrombium shirazicum* Zhang sp. n. is described and illustrated from larvae parasitic on *Forda marginata* Koch (Pemphigidae) and unidentified aphids in Shiraz, Iran. *Monotrombium simplicium* Zhang is newly recorded from larvae parasitic on aphids in wheat fields in Shiraz, Iran.

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Key words. – Acari; Trombidiidae; classification; larvae; key; ectoparasites; aphids; Pemphigidae; *Monotrombium*; *Allothrombium*; Iran.

Larvae of the genus *Allothrombium* and *Podothrombium* are common ectoparasites of aphids and are expected to have potential for use as biocontrol agents against aphids (Eickwort 1983, Welbourn 1983, Zhang 1991a, Zhang & Xin 1992). Discovery and accurate description of these parasitic mites are prerequisites for any research toward their potential use in pest control programs (Eickwort 1983, Welbourn 1983).

Recently, H. Norbakhsh of Shahid Chamran University, Ahwaz, Iran sent to the senior author some larval trombidiid mites which were found ectoparasitic on various wheat aphids in Shiraz, Iran. A study of these mites revealed a new species (*Allothrombium shirazicum* Zhang sp. n.) and a new record (*Monotrombium simplicium* Zhang) from Shiraz, Iran. The purpose of this paper is to describe the new species and to present a key to larvae of Trombidiidae parasitic on aphids in Iran.

The terminology and abbreviations used in this paper are adapted from Robaux (1974) and Welbourn & Young (1988). All the measurements of length are in micrometers.

### Key to larvae of Trombidiidae parasitic on aphids in Iran

1. Coxa II with one seta; genu II and genu III each with one solenidion ..... *Monotrombium* (*M. simplicium* Zhang) ..... 2
- Coxa II with two setae; genu II and III each with two solennidia (*Allothrombium*) ..... 2

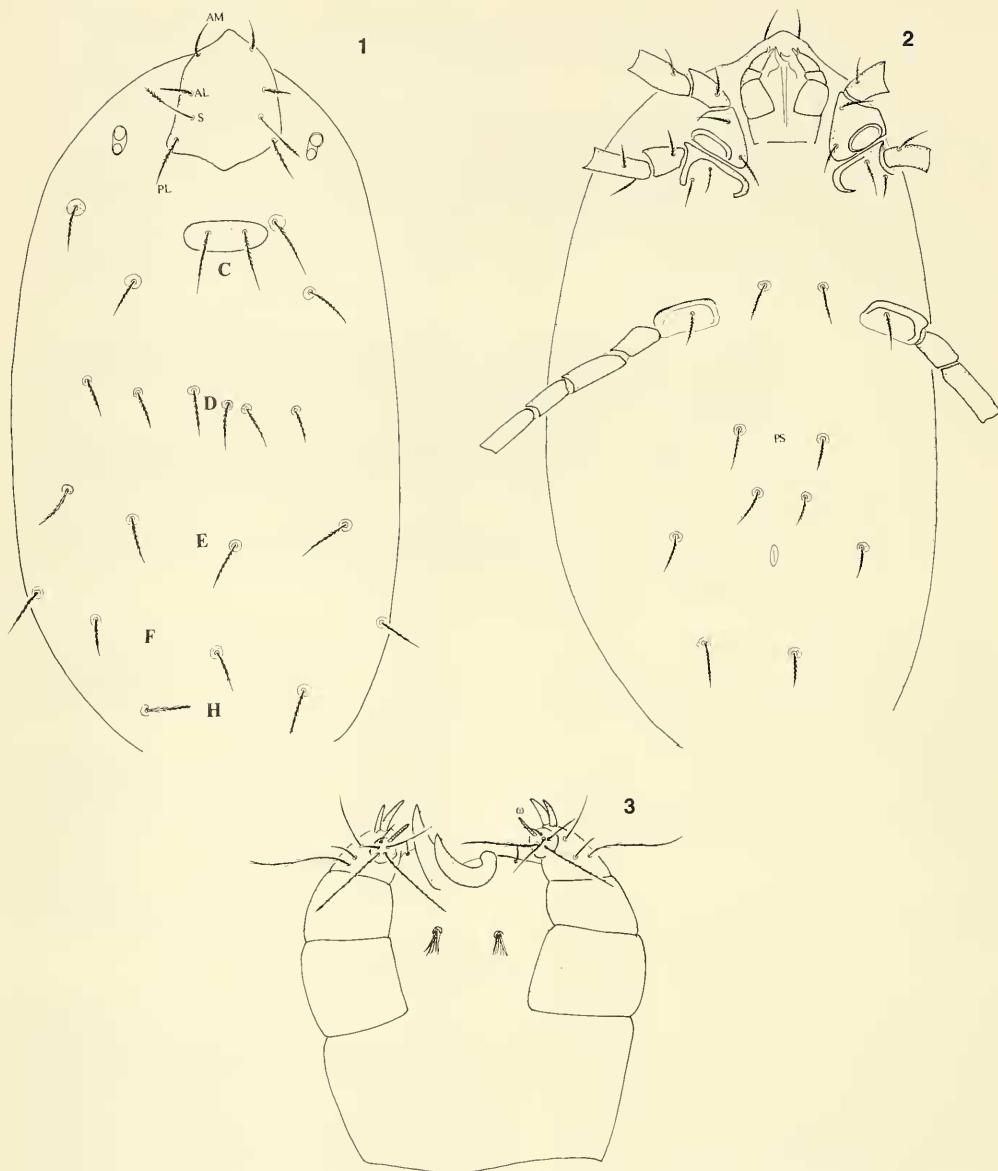
2. Tarsus III with two normal claws and an empodium ..... *A. pulvinum* Ewing
- Tarsus III with one normal claw and empodium; inner claw vestigial ..... 3
3. Idiosoma with more than 20 dorsal setae and more than 10 ventral setae ..... *A. mossi* Zhang
- Idiosoma with 20 dorsal setae and less than 10 ventral setae ..... 4
4. Legs short; tarsi I-III < 60  $\mu$  .... *A. triticum* Zang
- Legs long; tarsi I-III > 90  $\mu$  ..... *A. shirazicum* Zhang sp. n.

*Allothrombium shirazicum* Zhang sp. n.  
(figs. 1-6)

Type material. – Holotype larva (ZQZ 96-0128-3a) parasitic on an aphid, collected by N. Rastagari (No. 14, 58-19), on 20.iv.1992 in Shiraz, IRAN. – Paratype larva (ZQZ 93-0128-3b), same data as holotype. Paratype larvae (ZQZ 930128-2c, d) parasitic on *Forda marginata* Koch (Pemphigidae), collected by N. R. Nowband (No. 1-19), on 14.vi.1992 in Shiraz, IRAN. All types deposited in the The Natural History Museum (BMNH), London.

### Description

Larvae with the following features: fD = 4(+2)-6-4-4-2 = 18(+2); fV = 2-2-2u-2 = 8; fnTr = 1-1-1; fnFe = 5-4-4; fnGe = 4-3-3; fnTi = 5-5-5; fnTa = 17-14-13; fSol = I(0-2-2-1), II(0-2-2-1), III(0-2-0-0); fκ = I(1-1), II(1-0), III(0-0); fζ = 2-0-0; fe = 1-1-0; fPp = 0-0-0-BNN2-BBNNNω; IP = 1298 (1280-1320).



Figs. 1-3. *Allothrombium shirazicum* Zhang sp. n. Holotype larva. – 1, Idiosoma, dorsal view; 2, Idiosoma, ventral view; 3, Gnathosoma.

**Larva.** – Measurements are means of four specimens, with range in parentheses. Idiosoma engorged, holotype 750 long, 450 wide. Idiosoma dorsally with a scutum, a scutellum, a pair of ocular sclerites, and 24-26 dorsal setae. Scutum pentagonal in shape, widest at postero-lateral angles, with convex posterior side; small punctation on scutum denser on posterior

part than on anterior part; AM setae barbed, near antero-lateral angles of scutum; PL setae barbed, at postero-lateral angles; AL setae barbed, between AM and PL setae; S barbed only in distal half, between AL and PL setae. Scutellum with two barbed setae; wider than long, with small punctuation throughout. Standard measurements of scutum and scutellum as

follows: AM 39 (29-45); AA 60 (53-66); AL 44 (43-47); AW 87 (78-90); MA 42 (41-44); PL 72 (70-73); PW 104 (100-114); AP 46 (38-53); S 84 (79-90); SB 68 (64-70); ASB 94 (90-99); PSB 56 (55-59); SD 151 (145-158); W 124 (119-130); HS 37 (33-38); LSS 86 (79-93); SL 68 (65-72); SS 36 (29-43). Ocular sclerite, 37 (34-40) long, lateral to postero-lateral angles of scutum; with 2 eyes, the anterior eye (13-15 in diameter) larger than the posterior one (9-11 in diameter). All dorsal setae barbed, arising from small setal sclerites; dorsal setal formula fD = 4(+2)-6-4-4-2 = 18(+2).

Idiosoma ventrally with three pairs of coxae, 1 pair of intercoxal setae, eight pairs of ventral setae, and an anus. All setae on ventral idiosoma with barbs. Coxa I 82 (75-88) long, with two barbed setae. Coxa II 84 (81-88) long, with two barbed setae. Coxa III 74 (69-75) long, with a single barbed seta. Intercoxal setae between coxa III. Ventral setae with small setal sclerites; ventral setal formula fV = 2-2-2u-2 = 8.

Gnathosoma truncate posteriorly. Palpal setal formula fPp = 0-0-0-BNN2-BBNNN $\omega$ . A pair of adoral setae nude, 8 (6-9) long. A pair of subcapitular setae thick, branched distally, 11 (11-12) long, 119 (18-20) apart at base. Cheliceral base 65 (62-68) long; cheliceral blade 26 (23-30) long, curved with a single tooth distally.

Leg segmentation formula fSp = 6-6-6. IP = 1298 (1280-1320). Leg I 448 (431-456); trochanter 53 (50-55), with 1B; femur 83 (80-84), with 5B; genu 49 (47-50), with 4B, two solenidia  $\sigma$ , and a microseta  $\kappa$ ; tibia 78 (75-80), with 5B, two solenidia  $\phi$ , and a microseta  $\kappa$ ; tarsus 104 (96-108), with 17B, one solenidion  $\omega$ , one dorsal eupathidium  $\zeta$ , one terminal eupathidium  $\zeta$ , one famulus  $\epsilon$ ; claw-like empodium 20 (19-21), two lateral claws 32 (32-34) each. Leg II 414 (406-419); trochanter 52 (49-55), with 1B; femur 74 (71-75), with 4B; genu 40 (38-42), with 3B, two solenidia  $\sigma$  and one microseta  $\kappa$ ; tibia 71 (70-72), with 5B and two solenidia  $\phi$ ; tarsus 95 (92-96), with 14B, one solenidion  $\omega$ , and one famulus  $\epsilon$ ; claw-like empodium 22 (21-23), two lateral claws 31 (25-37) each. Leg III 436 (423-451); trochanter 57 (55-64), with 1B; femur 77 (75-79) with 4B; genu 42 (38-46), with 3B and two solenidia  $\sigma$ ; tibia 83 (80-86), with 5B; tarsus 102 (100-107), with 13B; claw-like empodium 26 (25-27), one lateral claw 37 (30-40).

## Remarks

Larvae of 13 *Allotrombium* species have been recognized worldwide (Zhang and Xin 1992; Zhang & Norbakhsh 1995). Four species are known only from Europe: *A. fuliginosum* (Hermann), *A. recki* Feider & Agekian, *A. neapolitanum* Oudemans, and *A. mon-*

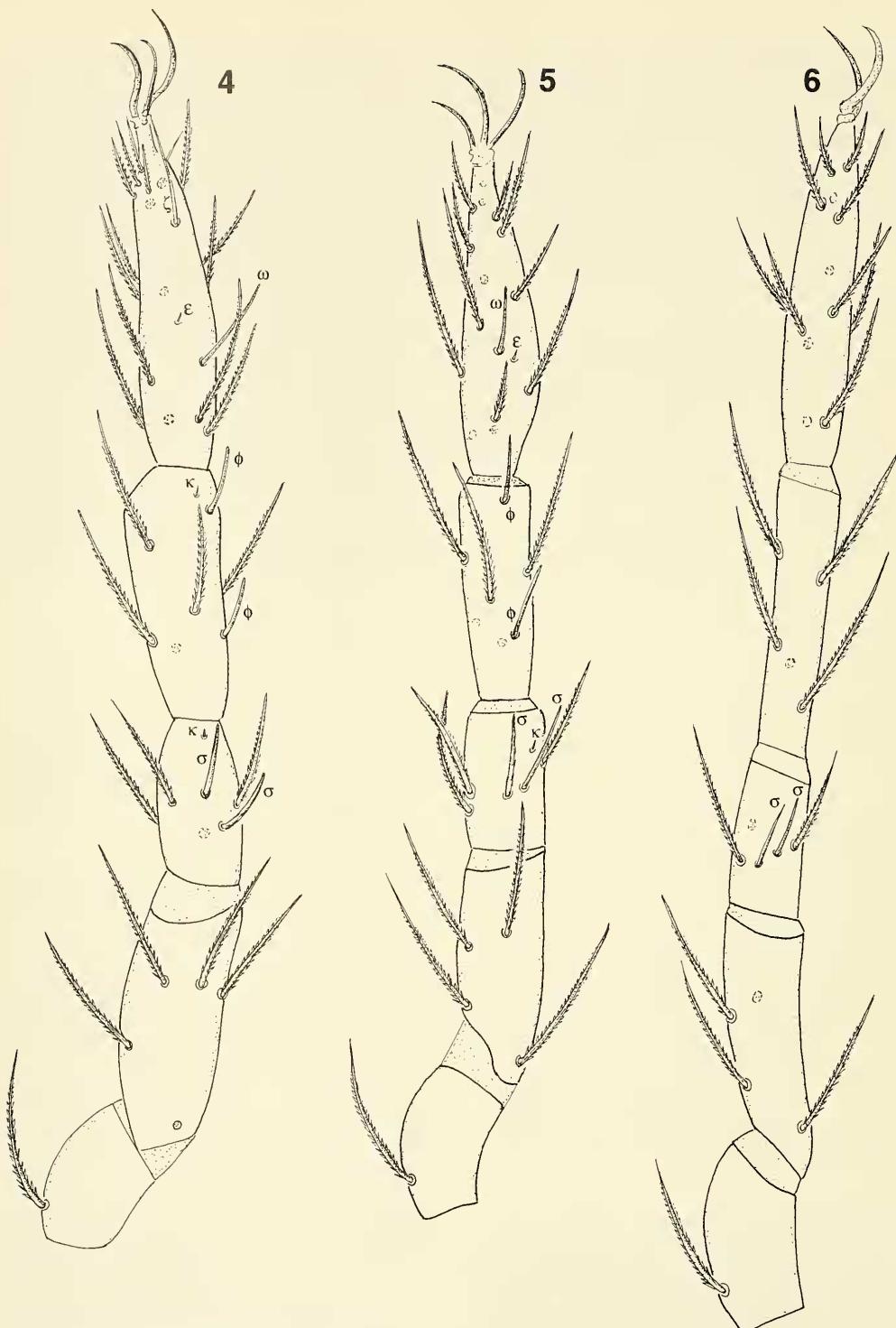
*pessulanum* Robaux & Aeschlimann (Feider 1951, Feider & Agekian 1967, Henking 1882, Hirst 1926, Robaux 1972, 1974, Robaux & Aeschlimann 1987, Oudemans 1910, 1912, Thor & Willmann 1947, Turk & Turk 1952). Six species have been recorded only from Asia: *A. ovatum* Zhang & Xin, *A. kekko* (Southcott), *A. epiphyllus* Shiba, and *A. chanaanense* Feider, *A. triticum* Zhang, and *A. mossi* Zhang (Feider 1977, Shiba 1976, Southcott 1986, Zhang & Xin 1992, Zhang & Norbakhsh 1995). Two species are known only from North America: *A. lerouxi* Moss and *A. mali* (Childers & Vercammen-Grandjean 1980; Moss 1962). *A. pubinum* Ewing appears to be a cosmopolitan species and has been reported from Europe, Asia (China and Iran), and North America (Howard 1918, Miller 1925, Minks & Harrewijn 1988, Zhang 1988, 1991b, Zhang & Faraji 1994, Zhang & Xin 1989a, b, 1992), although its presence in Europe needs to be confirmed. The new species, *A. shirazicum*, is related to *A. triticum*, but can be distinguished from the latter from its long legs: leg lengths of I-II-III are 448-414-436 for *A. shirazicum*, but 335-328-367 for *A. triticum*.

## *Monotrombium simplicium* Zhang

### Description

Larvae with the following features: fD = 2-2-6-4-4-2=20; fV = 2-2-2u-2 = 8; fcx = 2-1-1; fnTr = 1-1-1; fnFe = 5-4-4; fnGe = 4-3-3; fnTi = 5-5-5; fnTa = 17-14-13; fSol = I(0-2-2-1), II(0-1-2-1), III(0-1-0-0); fk = I(1-1), II(1-0), III(0-0); f $\zeta$  = 2-0-0; fe = 1-1-0; fPp = 0-0-0-BNN2-BBNNN $\omega$ ; IP = 805; tarsus III with reduced inner claw. IP = 785 (754-814).

Larva. — Measurements are means of four specimens, with range in parentheses. Idiosoma 492-530 long, 280-300 wide. Standard measurements of scutum and scutellum as follows: AM 36 (35-38); AA 51 (48-54); AL 33 (25-39); AW 62 (59-65); MA 32 (31-34); PL 47 (45-47); PW 79 (74-83); AP 35 (34-35); S 48 (43-52); SB 50 (49-50); ASB 66 (63-68); PSB 43 (36-49); SD 109 (99-117); W 94 (81-104); HS 32 (25-36); LSS 68 (59-81); SL 42 (39-45); SS 25 (23-26). Ocular sclerite, 23 (22-25) long and 13 (11-13) wide; the anterior eye (diameter 9-11) larger than the posterior one (diameter 5-7). Palpal 52 (51-54) long. Adoral seta 6 long. Subcapitular setae 7 (6-7) long, 12 (11-12) apart at base. Cheliceral base 44 (42-45) long; cheliceral blade 12 (11-14) long. IP = 785 (754-814). Leg I 258 (250-262) long; coxa I 51 (45-57) long; trochanter 33 (32-34) long; femur 48 (47-49) long; genu 29 (27-31) long; tibia 42 (38-47) long; tarsus 57 (51-61) long; claw-like empodium 21 (19-22) long, two lateral claws 15 (13-16) long each. Leg II 253 (243-268) long; coxa II 58 (54-61); trochanter 32 (31-32) long; femur 45 (43-45) long; genu 24 (22-



Figs. 4-6. *Allothrombium shirazicum* Zhang sp. n. Holotype larva. — 4, first leg; 5, second leg; 6, third leg.

25) long; tibia 40 (36-43) long; tarsus 53 (49-58) long; claw-like empodium 23(21-23) long, two lateral claws 16 (14-17) each. Leg III 275 long; coxa III 55 (54-56) long; trochanter 35 (34-36) long; femur 49 (43-52) long; genu 28 (25-31) long; tibia 46 (42-50) long; tarsus 61 (53-68); claw-like empodium 25 (23-28), one lateral claw 17 (16-18).

Material. — Larvae (ZQZ 93-0128-2a, b, and e), IRAN, Shiraz, on wheat aphids, 14.iv.1992, N. Rastegari.

### Remarks

This species was first described from larvae parasitic on aphids in Shahrkord, Iran (Zhang & Norbakhsh 1995). This is a new record of this species from Shiraz, Iran. The Shiraz specimens are almost identical to those from Shahrkord. A minor exception is that the subcapitular setae are longer and more narrowly spaced at base in the former than in the latter; 7 long, 12 apart at base in Shiraz specimens but 5.3 long, 13 apart at base in specimens from Shahrkord.

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